previous workers, and displayed more than ordinary ingenuity in devising new methods to avoid such errors, and at the same time he paid particular attention to the necessity of employing the purest material in such work. He was never satisfied with even repeated experiments on different amounts by the same method, and always, whenever practicable, adopted two or more independent methods. If we include those elements which he did not completely study, he determined the atomic weights of no fewer than twenty-nine of the elements, and in nearly every case his numbers differ little from those now adopted —a remarkable feat for one man working without any assistance. In the course of his investigations he analysed certain of the minerals containing the rare earths, and succeeded in separating two new elements, ytterbium from gadolinite and gadolinium from samarskite.

The process of time has brought it about that much of his work begins to have mainly historical interest, and probably at the present day most chemists will feel more vivid interest in researches which were to some extent incidental to the principal investigation. Prominent among these is his elaborate work relating to the intricate and puzzling problem in analysis presented by titanium, niobium, and tantalum. So difficult is the separation of these three elements, when occurring together in the same substance, that many eminent chemists have imagined the existence of other elements; for instance, Hermann strongly insisted on the presence of ilmenium in samarskite, but Marignac showed it to be really a mixture of niobium and tantalum. Although it cannot be said that he solved the problem with complete success, yet Marignac was the first to devise a method—the differing solubilities in hydrofluoric acid of the double fluorides of the three elements with potassium—which effected any real separation, and which to this day has not been superseded by any more satisfactory. The problem is one that still awaits solution, and is occupying the attention of many chemists. It is of interest to note that, in recognition of the method devised by him, the name marignacite was recently assigned by Mr. Weidman and Mr. Lenher to a variety of pyrochlore from Wausau, Wisconsin. Of little less vivid interest is his comprehensive investigation relating to the formula of zirconia and the atomic weight of the element. He made use of the law of isomorphism propounded by Mitscherlich, of which he was early a keen advocate, and undertook a complete chemical and crystallographical examination of a large number of fluozirconates. None of his experiments lent any confirmation to the idea put forward by Svanberg that zirconia contains three distinct metallic oxides. Nevertheless, the question is one deserving of further consideration. Prof. Church and other observers have noted a remarkable range in the density of zircons, 4·0 to 4·7, and an even more remarkable alteration in the density effected in certain stones of low density by the application of heat, and the conclusion has been drawn that there are three varieties of zircon. Further, the crystallised native zirconia, baddeleyite, presents almost as wide a range of density, which is even more difficult to understand in the case of an apparently simple oxide. It is possible that zirconium has never been completely isolated; it is well known that a satisfactory method for separating it from titanium has yet to be found.

Marignac found time to examine the chemical and crystallographical characters of a large number of minerals, and also of artificial salts prepared by him in the laboratory. The sentence with which he opens one of his elaborate papers is indicative of the thoroughness characterising his work, and embodies a maxim which even now is by no means universally appreciated by chemists:—

"L'intérêt que présente l'étude des formes cristallines des divers composés chimiques, m'a engagé à ne jamais négliger de déterminer exactement les formes de ceux qui s'offraient à moi, en cristaux déterminables, dans le cours de mes travaux de laboratoire."

Towards the end of his career his attention was attracted to the physical side of chemistry, and he carried out with his customary skill and care a lengthy series of thermochemical determinations; unfortunately, the complete collapse of his physical vigour brought his work to a premature close. To his other investigations—for instance, on ozone—space will not permit us to allude.

As regards the appearance of the volumes, the quality of the paper and the style of the printing are beyond criticism, and care has been taken to indicate the original pagination. Most of the papers were published in the *Bibliothèque Universelle de Genève* or the *Annales de Chimie et de Physique*; those dealing with mineralogical subjects appeared in the *Annales des Mines*.

THE BLOOD-SUCKING GNATS.

A Monograph of the Culicidae or Mosquitoes. Mainly Compiled from Collections received at the British Museum. Vol. iv. By F. V. Theobald. Pp. xix+639; 16 plates. (London: Printed by order of the Trustees, 1907. Sold by Longmans and Co., B. Quaritch, Dulau and Co., and at the British Museum [Natural History].) Price 1*l.* 12*s.* 6*d.*

THIS work forms the second supplementary volume to Mr. Theobald's original monograph of the Culicidæ of the world, in two volumes, published by the trustees of the British Museum in 1901. The present volume deals very largely with the new species which have been added to the national collections, and besides these it also embodies the descriptions of one hundred and sixty species which have been described by various authors since the issue of the first supplementary volume in 1903.

It would be difficult to overestimate the great scientific value of Mr. Theobald's most exhaustive faunistic work on these insects. It is a model of painstaking scientific accuracy, and we congratulate him on its issue.

With the exception of the adoption of a few characters in an admirable scheme of general

classification drawn up by Dr. Lutz, no changes have been made in this volume. The Corethrinæ have, however, been excluded from the Culicidæ and raised to family rank, partly on account of the asiphonate character of the larvæ, but mainly by the absence of piercing mouth-parts and of scales in the adults.

Felt's [1] new method of classification, based upon the genital armature of the males and the wing venation, is discussed at some length, but abandoned as unpractical on the grounds (1) that the majority of known mosquitoes are females only, and thus we should not be able to place many of our well-known species in any genus; and (2) that the cross-veins in the venation of the wings are subject to so great a variation that generic characters cannot be fixed by them. The author also points out that Messrs. Dyar and Knab's [2] unusual classification of the Culicidæ by larval characters only cannot be admitted. We need scarcely point out that any radical changes in the classification of these insects will result in endless confusion, especially so if based mainly upon local knowledge; and as practically all British, French and South American doctors and entomologists have adopted the Theobaldian classification, anything more than a modification of this system would be followed by somewhat disastrous results, especially among the students of the medical profession who are engaged in the study of the Culicidæ in connection with tropical diseases.

In the general notes we find a reference to Major Adie's evidence as to the benefit of *Lemma minor*, L., as a means of preventing mosquitoes from laying their eggs on water. He states that "tanks covered with this flat weed never contain larvæ of Culicidæ, whilst others at the same time of year are full of them." This genus of plants has apparently the same marked effect upon the frequency of both Anopheles and Culex in this country.

The natural reservoirs formed by the flowers of *Heliconia brasiliensis*, Hook., in Ceylon, the leaves of Nepenthes and various Bromeliaceous plants and the cut ends of bamboo in South America, are given as the breeding places of both Anophelines and Culicines. Mr. E. E. Green, of Ceylon, has contributed some notes on *Myzomyia rossii*, Giles, which he found breeding in the brackish lake at Batticaloa. There are also some interesting notes on the bionomics of *Nyssorhynchus fuliginosus*; but apart from these and a few other references to the habits of mosquitoes, very little is known of the earlier stages of a large proportion of the Culicidæ, so that those who have the opportunity of observing these insects have the pleasure of discovery before them.

In a work which has been so admirably performed, it is invidious, perhaps, to direct attention to any errors either of omission or commission, but we note that Patton's [3] important paper in which he describes five new species of Anophelinæ has been quite overlooked, nor do we find any reference to Grünberg's [4] new Anophelines described in 1905.

Myzomyia hebes, Dönitz (p. 42); *Cellia punctulata*, Dönitz (p. 109); and *Howardina chrysolineata*, Theob. (p. 218), are all omitted from the synoptical tables; while *Pyretophorus pitchfordi*, Power (p. 72), and *Nyssorhynchus indiensis*, Theob. (p. 98), are omitted both from the synoptical tables and the lists of species given under the respective genera.

Myzomyia listoni, Liston, is given priority on pp. 41, 43, but is sunk to the position of a synonym of *M. christophersi*, Theob., on p. 51. Under *Culicada fitchii*, Felt and Young (p. 321), Fig. 112 is described as *Grabhamia fitchii*; there are also some minor errors in the text, evidently printer's. R. N.

COMMERCIAL ORGANIC ANALYSIS.

Commercial Organic Analysis. By A. H. Allen. Vol. ii., part iii. Pp. xii+547. Third edition, re-written and revised by the Author and A. R. Tankard. (London: J. and A. Churchill, 1907.) Price 20s.

WITH the publication of this volume, the whole of this standard work on the analysis of organic materials occurring in commerce is again available in a revised form. The preparation of this portion was undertaken by Mr. Allen so long ago as 1898, but, owing to his ill-health, little progress was made, and after his untimely death in 1904 the completion of the book was undertaken by Mr. Tankard.

The recent considerable additions to our knowledge of volatile oils, rubbers, gutta-perchas, and resins, the four principal groups of products now dealt with, have necessitated extension of the space devoted to these subjects in previous editions. As regards resins and volatile oils the author was assisted by Mr. E. J. Parry, and in the preparation of the article on oil of turpentine Mr. Archbutt was consulted, whilst Dr. Leffmann, of Philadelphia, contributed a portion of the section on aromatic acids and their hydroxy-derivatives.

The method of treatment adopted is to give a short critical *résumé* of the present position of the chemistry of each product, followed by a summary of the analytical methods available for its examination, one or more of these being finally recommended as giving trustworthy results in the author's own experience.

In spite of the care which has evidently been taken to secure accuracy in the information given, the specialist will be able to find here and there in the sections in which he is particularly interested statements requiring emendation or amplification. Thus the important matter of the botanical sources of rubber should not have been dismissed in the statement that it is "obtained from the latex of trees growing in S. America, Africa, India, &c.," supplemented by the inaccurate footnote, "A *new* source of caoutchouc has been recently discovered in the root-bark of *Landolphia thrallonii*, a plant growing in Lower Guinea and the French Congo." The statement that gutta-percha occurs in the latex of various trees belonging to the Sapotaceæ (*e.g. Palaquium pustulata* and other species) is all the information vouchsafed regarding the source of this important product, and is misleading since the best gutta is obtained from *Palaquium gutta*, *P. pustulata* yield-

[1] Bull. 79, Ent. 22. New York State Museum. (1904.)
[2] "The Larvæ of Culicidæ classified as Independent Organisms." Journ. New York Ent. Soc., vol. xiv., pp. 169–230. (1906.)
[3] Journ. Bombay Nat. Hist. Soc., 1905.
[4] Zool. Anzeiger, Bd. xxix., No. 12, September, 1905.